Amendments to the Drawings:

The attached sheet of drawing is a new Fig. 4. No new matter has been added.

Attachment: New Sheet

REMARKS

Claims 19, 20, 25 and 36 have been cancelled. Claims 18, 21-24, 2635 and 37-38 are now pending in the application.

In the Office Action the drawings were objected to under 37 CFR 1.83(a) for not showing every feature of the invention specified in the claims, and specifically, for not showing the elements for achieving contra-rotating swirl flows. Applicants have added new figure 4 that shows a mirror image of the cross section along line A-A shown in Fig. 2. When used in conjunction with the swirl chamber shown in Fig. 3, the swirl chamber of Fig. 4 provides a swirl that is contra-rotating relative to that produced in the device if Fig. 3, as explained in the specification, for example in paragraph [0021]. The specification was amended to include a reference to new Fig. 4, and a description thereof in paragraph [0032]. No new matter was added, because Fig. 4 is simply an identical mirror image of what was shown in Fig. 2.

Claims 18-34 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite. Applicants have amended claims 18, 24, 35 and 37 to more clearly define the invention. Applicants have canceled claims 19-20, 25 and 36. Applicants respectfully submit that the pending claims are now definite.

In the Office Action, claims 24-33 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite, and under 35 U.S.C. 101, as improperly reciting a process. Applicants have amended claims 24-33 to more correctly recite the process steps.

Claims 18, 22-24, 26, 31, 34-35 and 37 were rejected in the Office Action under 35 U.S.C. 102(b) as being anticipated by Keating (U.S. 3,240,433). Claims

19-21, 30, 32-33, 36 and 38 were rejected under 35 U.S.C. 103(a) as being unpatentable over Keating in view of Brundish (U.S. 6,474,569), claim 25 in view of Luxton et al. (U.S. 5,769,624), and claims 27-29 in view of Sirignano et al. (U.S. 2002/0187447).

Keating describes a burner having a casing 12 in which open a gas inlet 22 and an air inlet 21 are provided. (Col. 3, lines 1-16.) A swirl chamber 52 is also provided, to cause the air to swirl, so that the gas is entrained by the swirling air. (Col 3, line 68- Col. 4, line 19.) However, Keating does not describe or suggest controlling the amount of swirl of the gas and of the air, to obtain a desired resulting flame shape. This reference also does not describe or suggest gas inlet lines or oxygen inlet lines that are split, so that one of the split lines enters a swirl chamber eccentrically, and the other split line enters it directly, to avoid producing a swirl effect. No control unit of any kind is described in Keating, and in particular no control unit to adjust valves to obtain a desired swirl of the gas and of the oxygen, resulting in a desired flame shape.

Brundish et al. describes a fuel injector for an aircraft gas turbine engine, adapted to vary the fuel or air flow in certain areas of the combustor, such as the pilot zone and the primary zone, which require different amounts of fuel enrichment in the combustion mixture. (Col. 2, lines 47-59.) Brundish et al. describes diverting combustion air into either a first or a second flow channel, having different degrees of resistance due to different degrees of swirl. (Col. 3, lines 44-55; Col 4, lines 45-60.) The different swirl levels of the air are thus necessary to obtain a richer fuel mixture in the pilot zone compared to the primary zone of the turbine's combustor. However, there is no description or

suggestion in this reference of controlling the amount of fuel entering a swirl chamber eccentrically. In addition, the fuel used in the aircraft gas turbine described by Brundish et al. is liquid kerosene, and is not a gas. In fact, although a fuel swirler 2.5 is described in Brundish et al., only flow of the combustion air is varied by directing the air along one of two separate paths. Brundish et al. thus does not describe or suggest controlling the swirl of an oxygen flow and of a gas flow by selecting how much of the oxygen and of the fuel enters a swirl chamber eccentrically, to control a shape of a flame.

None of the above references cited in the Office Action describes an externally mixing burner, in which the fuel-gas and the oxygen containing gas are mixed outside of the burner, as recited in the claims. Instead, Keating describes mixing the fuel and oxygen internally, for example in Fig. 1, with the gas from line 14 and the air mixing within the casing 12. Brundish et al. also describes internal mixing, as explained in the abstract and as shown in Figs 5-7, where air and fuel are mixed within injectors 5, 6 and 7. In addition, Brundish et al. discloses a fuel that is liquid, for example the kerosene used in gas turbine aircraft engines,. The liquid fuel is sprayed in droplets (Col. 1, line 23), and cannot be handled in the same manner as the gaseous fuel of the present invention.

The additional references cited in the Office Action do not cure the deficiencies of Keating and Brundish et al. For example, Luxton et al. describes a variable flame burner, in which two separate nozzles 20 and 30 are used, each nozzle having different characteristics. (Col. 2, lines 3-8.) Sirignano et al. describes a miniature liquid fueled combustion chamber, in which the liquid fuel

is injected as a film that covers the chamber walls, to control their heating. (Paragraph [0007].)

In contrast, the present claimed invention is an externally mixing burner where the mixing of fuel gas and oxygenated gas takes place externally, outside the burner head, as shown and explained in the specification, for example in Fig. 1. The claimed burner uses gas tubes to provide the fuel and the oxidizer, which are thus gaseous and not liquid.

As recited in claim 18, the burner has at least one gas inlet line connected to one of the combustion gas source and the oxygen-containing gas source, which opens eccentrically into a swirl chamber arranged between the gas inlet line and the corresponding one of the combustion gas tube and the tube for oxygen-containing gas. At least one of the gas inlet lines is divided into first and second lines upstream of the at least one swirl chamber, such that the first line opens eccentrically into the at least one swirl chamber, and the second line opens directly into a respective one of the combustion gas tube and the tube for oxygen-containing gas. In addition, a control unit is provided to control valves disposed in divided portions of the gas inlet lines, to control a degree of opening of the valves to vary a desired shape of a flame of the burner by selecting a quantity of combustion gas and a quantity of oxygen-containing gas being directed in the at least one swirl chamber.

None of the cited references disclose the claimed structure of two inlets, one of which enters a swirl chamber eccentrically, and another that directly enters the gas tubes. In addition, the cited references do not disclose controlling a degree of opening of valves to vary a desired shape of a flame of the burner, by

selecting a quantity of combustion gas and a quantity of oxygen-containing gas being directed through the corresponding swirl chambers. Accordingly, applicants respectfully submit that claim 18 is not anticipated nor obvious, and is allowable.

Independent claims 25, 35 and 37 also include elements that are not described in the cited references, as discussed above. Accordingly, in view of the same arguments, applicants respectfully submit that they are also allowable. The remaining pending claims depend from allowable claims, and at least for that reason are also submitted to be allowable.

If there are any questions regarding this Amendment or this application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323 (Docket 038724.57896US).

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